

Attorney Docket No. 5002.02-1
Customer No. 23308

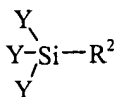
Amendments to the Claims:

This listing of claims will replace all prior versions, and listing, of claims in the application:

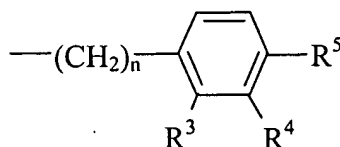
Listing of Claims:

Claim 1. (currently amended): A method for forming a diffusion barrier layer between a copper metal layer and a silicon substrate comprising the steps of:

- a) preparing the silicon substrate;
- b) contacting the silicon substrate with a composition comprising self- assembled monolayer subunits and a solvent;
- c) removing the solvent thereby forming the diffusion barrier; and
- d) forming a copper metal layer on the diffusion barrier as formed in step (c) using a vapor deposition process, said diffusion barrier inhibiting copper diffusion into the substrate[[]], wherein the self-assembled monolayer subunit is of the following structure:

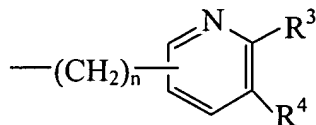


wherein Y is an O-alkyl group, and wherein R² is a group selected from



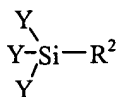
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and



wherein R³, R⁴ and R⁵ are independently selected from the group consisting of hydrogen, alkyl groups, heteroalkyl groups, halo groups, NH₂, NHR⁶, NR⁶R⁷, OH, OR⁶, SH, SR⁶, CHO, COOH and CN, and wherein R⁶ and R⁷ are alkyl groups, and wherein n is an integer ranging from 1 to 5.

Claim 2. (Currently amended): The method of claim 1 wherein the self assembled monolayer subunit is of the following structure:



wherein Y is an O-alkyl group, and wherein R² is an alkyl group, ~~heteroalkyl group,~~ linked to an aryl group or heteroaryl group.

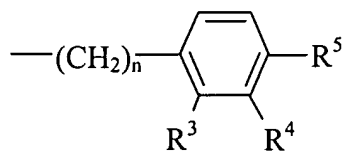
Claim 3. (canceled).

Claim 4. (original): The method according to claim 1, wherein the silicon substrate preparation comprises the formation of a silicon oxide surface.

Claim 5. (original): The method according to claim 1, wherein the method further comprises the step of heating the silicon substrate and the composition during contact.

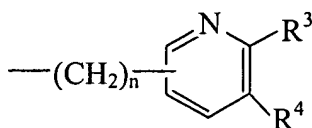
Claim 6. (original): The method according to claim 2, wherein R² is an alkyl group of the following structure:

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wherein R^3 , R^4 and R^5 are independently selected from the group consisting of hydrogen, alkyl groups, heteroalkyl groups, halo groups, NH_2 , NHR^6 , NR^6R^7 , OH , OR^6 , SH , SR^6 , CHO , $COOH$ and CN , and wherein R^6 and R^7 are alkyl groups, and wherein n is an integer ranging from 1 to 5.

Claim 7. (currently amended): The method according to claim 2, wherein R^2 is an alkylheteroaryl group of the following structure:



wherein R^3 and R^4 are ~~independently selected from the group consisting of~~ hydrogen, ~~alkyl groups, heteroalkyl groups, halo groups, NH_2 , NHR^6 , NR^6R^7 , OH , OR^6 , SH , SR^6 , CHO , $COOH$ and CN , and wherein R^6 and R^7 are alkyl groups,~~ and wherein n is an integer ranging from 1 to 5.

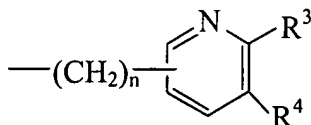
Claim 8. (previously presented): The method according to claim 2, wherein Y is OCH_3 .

Claim 9. (original): The method according to claim 6, wherein Y is OCH_3 .

Claim 10. (original): The method according to claim 7, wherein R^3 , R^4 and R^5 are hydrogen and n is 2.

Claim 11. (original): The method according to claim 8, wherein R^2 is an alkyl group of the following structure:

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and wherein R³ and R⁴ are hydrogen and n is 2.

Claims 12-23 (canceled).

Claim 24. (currently amended): A method of forming a device, the method comprising:

- (a) providing a substrate;
- (b) providing a diffusion barrier layer, wherein the diffusion barrier layer comprises a self-assembled monolayer, wherein the self-assembled monolayer is a single layer of molecules, and wherein the molecules in the self-assembled monolayer have first ends attached to the substrate and second ends , comprising aromatic groups, projecting upward from the substrate; and
- (c) forming a copper metal layer on the diffusion barrier layer as formed in step (b) using a vapor deposition process, wherein the copper in the metal layer is in direct contact with the second ends of the molecules in the self-assembled monolayer, and the diffusion barrier prevents diffusion of copper atoms into the substrate.

Claim 25. (previously presented): The method of claim 24 wherein the device is capable of being biased at about 2 MV/cm at about 200°C for about 30 minutes without diffusion of the copper into the substrate.

Claim 26. (previously presented): The method of claim 24 wherein the substrate comprises silicon oxide on silicon.

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Claim 27. (canceled).

Claim 28. (previously presented): The method of claim 24 wherein the vapor deposition process is a sputtering process.